tionary until the 14th, when it recurved southward to the fifty second parallel, where it was central on the 15th. By the 16th the storm-centre had moved northeast to the fifty-sixth parallel, after which it disappeared north of the region of observation. This storm increased in energy as it advanced eastward, and from the 12th to the 15th, inclusive, occasioned strong to whole gales over mid-ocean along the trans-Atlantic routes.

7.—This depression (low area iv) was central on the morning of the 17th off the southern coast of Newfoundland, without evidence of marked energy, from which locality it passed northeast and disappeared north of the fiftieth parallel.

8.—This storm (number vi) was a hurricane of tropical origin. It is first located northeast of the Windward Islands under date of the 17th; from this position it is given an approximate path westward to the Bahama Islands, where it arrived on the 22d; during that and the following date the storm-centre recurved slowly to the northward, and, pursuing an abnormal northerly course, advanced to the south New England coast by the night of the 25–26th, after which it moved slowly along the New England coast, over eastern Maine, New Brunswick, and the southern part of the Gulf of Saint Lawrence to the vicinity of Cape Race, N. F., by the 30th. This storm was attended by very destructive gales off the coast of the United States from the 21st to the 27th, inclusive. On the 22d its influence extended to the fortieth parallel, and after its recurve over the Bahama Islands it augmented in energy until the 26th, when minimum pressure falling below 29.00 (737.0) was reported, after which there was a marked diminution in strength until the 30th, when the depression exhibited small energy. Storms of this class at this season generally follow the trend of the Gulf Stream after recurving to the northward. In the present instance the abnormal westerly movement may possibly be due to the very high barometric pressure which prevailed over and south of Newfoundland during the advance of the storm northward from the Bahamas. On the 26th there was a gradient of about two inches between the storm-centre's position and southern Newfoundland; subsequent to which date the storm gradually lost energy and a marked decrease in pressure occurred over and near Newfoundland. The conditions attending the unusual course of this storm give color to the belief that a storm's course is largely governed by the movements and position of areas of high pressure. Some of the most destructive storms noted along the Atlantic coast of the United States have appeared as depressions deflected westward to, or near, the coast by some undefined cause, which possibly may have been areas of high pressure located over, and south of, Newfoundland.

9.—This depression (low area v) moved rapidly northeastward from the Gulf of Saint Lawrence, where it was central on the 20th, to about N. 56°, W. 38° by the 21st, after which it advanced slowly east-northeast and disappeared in the vicinity of the twentieth meridian after the 23d, attended until the 22d, inclusive, by strong to whole gales.

10.—This depression first appeared over mid-ocean on the 23d, and was, apparently, a subsidiary development of depression number 9. Moving east-northeast the centre of depression disappeared north of the British Isles after the 25th, its passage being attended by strong to whole gales.

11.—This depression was apparently central about ten degrees west of the British Isles on the 26th, and by the 28th had advanced to the southwest extremity of Ireland, after which it probably recurved northward. This storm, in connection with number 10, caused low pressure to prevail over the British Isles during the last seven days of the month, and occasioned fresh to strong gales westward over the ocean to the fortieth meridian.

OCEAN ICE IN NOVEMBER.

No ice was reported during the month. In 1882, 1883, and 1887, none was reported. In 1886, only one berg, fifty to sixty feet high, was observed on the 2d in N. 45° 20′, W. 45° 26′. In 1885, the only iceberg reported was observed in N. 48°, W. 51° 10′. In 1884, several icebergs were seen in N. 45° 56′, W. 52° 38′.

FOG IN NOVEMBER.

The limits of fog-belts to the westward of the fortieth meridian are shown on chart i by dotted shading. In the vicinity of the Banks of Newfoundland no fog was reported until the 17th, after which it occurred on six days; for October, 1888, it was reported on eleven days, and for November, 1887, fourteen days. Between the fifty-fifth and sixty-fifth meridians fog was reported for a total of seven days as compared with two days for October, 1888, and three days for November, 1887. To the westward of the sixty-fifth meridian fog was reported on seven days as compared with five days for October, 1888, and three days for November, 1887. From the above it will be seen that when compared with November, 1887, there was a marked deficiency in the number of fog-banks reported near Newfoundland, while to the southward of Nova Scotia and off the coast of the United States there was a decided increase in the number of days on which fog was reported.

As compared with the chart of the preceding month slight changes are shown in the southern limits of the fog-belts, while in November, 1887, fog was reported about one degree farther south in the vicinity of the Grand Banks than in the corresponding month of 1888.

On the several days for which fog was reported near Newfoundland the presence of an area of low pressure was shown to the west or northwest, except on the 18th when fog was encountered with variable winds and rising barometer following the passage to the northward of a storm-centre. Between the fifty-fifth and sixty-fifth meridians the development of fog attended the passage to the northward of areas of low pressure. Off the coast of the United States fog followed the passage of areas of low pressure eastward over the Gulf of Saint Lawrence, except during the 9th and 10th, when a depression of considerable strength advanced from the Mississippi Valley to the Saint Lawrence Valley, and on the 15th and 26th, when depressions were central off the middle Atlantic coast.

The following are limits of fog-areas on the north Atlantic Ocean during November, 1888, as reported by shipmasters:

Date.	Entered.		Cleared.		Date.	Entered.		Cleared.	
	Lat. N.	Lon. W.	Lat. N.	Lon. W.		Lat. N.	Lon. W.	Lat. N.	Lon. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
3	49 00	62 20	49 27	60 50	20	47 16	47 00	46 46	48 33
6	36 57	75 50	36 57	75 50	20	44 55	49 05	44 12	53 00
6	Sandy Hook.		Off Barnegat.		21	42 50	60 58	42 40	62 10
6	40 37	72 00	Sandy Hook.		26	40 44	67 31	40 32	68 15
7	42 36	65 24	42 35	66 06	27–28	46 08	55 11	45 30	58 25
7	36 00	75 00	36 50	74 45	28	43 57	52 44	43 27	56 05
9–10	40 45	68 43	40 26	73 50	27–29	46 00	54 00	42 40	60 00
10	Nantucket Shoals		Sandy Hook.		28–29	46 30	47 36	44 07	57 10
15–16	40 35	69 30	40 28	69 16	28–29	45 22	52 38	43 30	58 57
16	42 36	66 52	42 34	67 04	28–29	44 00	53 00	43 00	60 00
16–17	42 49	60 18	42 37	63 23	28–29	46 05	52 50	45 05	60 08
17	44 58	53 06	44 48	54 04	28–30	Dense fog at St. John's, N. F.			
17	Off south coast of Newfoundland.				29–30	45 00	48 30	43 00	53 00
17–18	47 34	50 20	48 30	43 50	29	44 14	56 00	43 40	58 07

TEMPERATURE OF THE AIR (expressed in degrees, Fahrenheit).

The distribution of mean temperature over the United States and Canada for November, 1888, is exhibited on chart ii by dotted isotherms. In the table of miscellaneous meteorological data the monthly mean temperatures and the departures from the normal are given for stations of the Signal Service. The figures opposite the names of the geographical districts in the columns for

mean temperature show the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the departure is below the normal and subtracting when above. Chart iii exhibits normal and current November temperature curves for selected stations.

The mean temperature was highest over southern Florida, where 74°.7 was reported at Key West. Over southern California and southwestern Arizona, at points in the lower Sacramento and lower San Joaquin valleys, and along the coasts of Louisiana and Texas, the mean values rose above 60°. The lowest mean temperature occurred over a portion of southern Montana, northern Dakota, northeastern Montana, and at stations in the valley of the south Saskatchewan River, where it fell below 25°. The lowest mean, 22°.1, was noted at Minnedosa, N. W. Ter. From the upper Missouri valley southward over central Colorado, and eastward north of the forty-fifth parallel to the Gulf of Saint Lawrence, the mean temperature was generally below 32°, except over the upper lake region and in eastern New Brunswick and Nova Scotia.

The mean temperature corresponded with the normal over portions of Quebec, New Brunswick, New England, eastern New York, Florida, and along and near the coasts of South Carolina and Georgia, along lines traced over the lower and upper Missouri, lower Mississippi and Rio Grande valleys, at points in the Rocky Mountain regions, on the north Pacific coast, and in the vicinity of Keeler, Cal. The greatest departures above the normal occurred in Manitoba, where they exceeded 7°, from which province they become gradually less marked southeastward to the middle Atlantic and middle Gulf coasts. The mean temperature was also above the normal in the middle plateau region of the Rocky Mountains, and along the Pacific coast south of the forty-fifth parallel. The departures below the normal were most marked in the northern and southeastern Rocky Mountain slopes, where they amounted to more than 6° in the former and 5° in the latter region. The mean temperature was also below the normal over portions of New England and eastern New York and in the lower Saint Lawrence valley, along the south Atlantic coast, in Florida, parts of New Mexico and Arizona, in the valley of the Columbia River, and on the north Pacific coast, the departures being generally small.

The following are some of the most marked departures from the normal at the older established Signal Service stations:

Above normal.		Below normal.	
	°		°
Duluth, Minn.	5.2	Fort Custer, Mont	6.5
Saint Vincent, Minn.	5.0	Helena, Mont.	6.3
Port Huron, Mich.	4.8	Abilene, Tex.	5.0
Chattanooga, Tenn.	4.0	Fort Smith, Ark	3.2
Milwaukee, Wis.	3.6	Lamar, Mo.	3.0

DEVIATIONS FROM NORMAL TEMPERATURES.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for November, 1888; (4) the departure of the current month from the normal; (5) and the extreme monthly means for November during the period of observation and the years of occurrence:

Deviations from normal temperatures—Continued.

State and Station.	County.	(1) Normal for the month of Nov.	(2) Length of record.	(3) Mean for Nov., 1888.	(4) Departure from normal.	(5) Extreme monthly mean temperature for November. Highest.	Year.	Lowest.	Year.
Arkansas.		°	*Years*	°	°	°		°	
Lead Hill	Boone	47.5	7	45.2	−2.3	50.0	1883	45.2	1886'88
California.									
Sacramento	Sacramento	51.0	23	48.8	−2.2	57.0	1875	44.7	1880
Colorado.									
Fort Lyon	Bent	36.8	19	37.8	+1.0	44.6	1867	19.6	1880
Dakota.									
Fort Randall	Todd	33.2	26	35.2	+2.0	43.0	1870	22.8	1880
Florida.									
Merritt's Island	Brevard	66.1	5	67.9	+1.8	69.2	1884	59.9	1885
Georgia.									
Forsyth	Monroe	55.9	14	56.9	+1.0	59.0	1874	51.0	1880
Illinois.									
Golconda	Pope	46.3	11	47.7	+1.4	50.2	1878	34.6	1880
Peoria	Peoria	39.6	33	41.9	+2.3	*42.8	1878'85	*30.2	1880
Riley	McHenry	33.1	28	37.1	+4.0	*37.1	1888	*24.1	1880
Indiana.									
Logansport	Cass	40.0	34	42.6	+2.6	†43.3	1881	†29.5	1880
Vevay	Switzerland	43.7	21	46.8	+3.1	53.8	1883	35.3	1880
Iowa.									
Cresco	Howard	28.9	14	32.8	+3.9	34.7	1878	19.2	1880
Monticello	Jones	33.4	35	36.9	+3.5	41.5	1859	25.0	1858
Logan	Harrison	35.6	14	38.8	+3.2	41.2	1878	27.5	1880
Kansas.									
Lawrence	Douglas	40.5	13	39.2	−1.3	45.9	1878	31.6	1880
Wellington	Sumner	41.5	9	40.6	−0.9	45.5	1879	29.0	1880
Louisiana.									
Grand Coteau	St. Landry	60.0	6	58.9	−1.1	63.9	1883	57.3	1884
Maine.									
Gardiner	Kennebec	35.8	52	36.4	+0.6	41.9	1849	26.4	1873
Maryland.									
Cumberland	Allegany	41.0	17	42.7	+1.7	45.0	1883'85	35.0	1880
Massachusetts.									
Somerset	Bristol	39.4	18	44.4	+5.0	‡44.8	1885	33.0	1873
Newburyport	Essex	39.2	9	41.2	+2.0	41.5	1883	36.5	1880
Amherst	Hampshire	38.1	14	40.8	+2.7	41.9	1885	32.8	1875
Michigan.									
Thornville	Lapeer	37.4	12	39.3	+1.9	40.4	1885	29.0	1880
Kalamazoo	Kalamazoo	36.7	13	40.1	+3.4	41.0	1879	27.0	1880
Minnesota.									
Minneapolis	Hennepin	28.2	13	33.0	+4.8	36.0	1878	17.4	1880
Missouri.									
Oregon	Holt	37.4	6	40.0	+2.6	44.9	1878	28.8	1880
Montana.									
Fort Shaw	Lewis & Clarke	32.5	20	35.1	+2.6	43.3	1867	19.9	1871
New Hampshire.									
Hanover	Grafton	33.3	54	34.8	+1.5	41.6	1849	24.8	1873
New Jersey.									
South Orange	Essex	41.9	14	43.8	+1.9	44.5	1885	37.5	1880
Moorestown	Burlington	41.8	25	45.3	+3.5	45.3	1888	36.2	1873
New York.									
Palermo	Oswego	34.4	35	37.6	+3.2	41.9	1859	26.8	1878
Cooperstown	Otsego	34.7	34	37.7	+3.0	38.5	1876–77	26.8	1873
Ohio.									
Wauseon	Fulton	35.6	18	40.1	+4.5	40.3	1883	27.9	1880
Oregon.									
Albany	Linn	43.7	9	45.2	+1.5	47.4	1884	40.7	1880
Eola	Polk	42.8	18	43.7	+0.9	46.7	1877	40.4	1879
Pennsylvania.									
Dyberry	Wayne	34.7	21	37.6	+2.9	38.2	1878'81	26.4	1873
Grampian Hills	Clearfield	34.9	24	37.8	+2.9	39.1	1877	28.3	1869
Wellsborough	Tioga	38.0	9	39.8	+1.8	44.4	1885	31.5	1880
South Carolina.									
Statesburgh	Sumter	53.5	8	53.5	0.0	55.9	1883	51.2	1882
Tennessee.									
Milan	Gibson	47.1	5	48.2	+1.1	49.1	1883	45.5	1884
Austin	Wilson	48.5	12	52.2	+3.7	54.5	1879	44.2	1876
Texas.									
New Ulm	Austin	59.2	16	57.1	−2.1	65.6	1879	49.6	1880
Fort Concho	Tom Green	53.9	16	53.1	−0.8	58.9	1879	43.4	1880
Vermont.									
Strafford	Orange	34.1	14	35.4	+1.3	39.3	1885	25.8	1875
Virginia.									
Bird's Nest	Northampt'n	49.4	19	50.1	+0.7	55.6	1881	41.9	1880
Wytheville	Wythe	42.1	24	45.1	+3.0	45.2	1881	36.0	1869
West Virginia.									
Helvetia	Randolph	40.4	11	42.6	+2.2	45.0	1883	34.4	1880
Washington.									
Fort Townsend	Jefferson	42.1	14	43.0	+0.9	47.3	1884	36.9	1879
Wisconsin.									1875
Madison	Dane	33.2	8	37.3	+4.1	37.3	1888	31.0	

* For 13 years. † For 9 years. ‡ For 16 years.

The highest temperatures for the month were reported in the lower Rio Grande valley, where a reading of 90°.2 was noted at Rio Grande City, Tex. Over a greater part of the interior of Texas values above 85° were recorded. Over the balance of Texas, and thence northward into Kansas, and eastward over the southern part of the Gulf states and south Atlantic states, in Florida, southern Arizona, and Los Angeles, Cal., the maximum temperature rose above 80°. At Portland, Me., Sandusky and Cleveland, Ohio, Louisville, Ky., Indianapolis, Ind., Chicago, Ill., Grand Haven, Mich., Milwaukee, Wis., Dubuque and Des Moines, Iowa, Yankton, Dak., Dodge City, Kans., Fort Elliott, Tex., Fort Sill, Ind. T., New Orleans, La., and Mobile, Ala., the maximum temperatures were higher than for any preceding November during the periods of observation. The most notable deficiencies occurred in northern Minnesota, northeastern Montana, in the middle and southern Rocky

Mountain regions, and along the north Pacific slope, where, at stations, the maximum temperatures were 10°, or more, below the maximum values for the corresponding month of previous years.

The lowest temperatures occurred in Montana, where they fell to —11°.5 at Fort Custer; they were generally below zero over the central and eastern parts of Montana, northern Dakota, northern Minnesota, and the northern portions of New Hampshire and Vermont. The minimum temperatures fell below 32°, except in southeastern Virginia, the eastern part of the south Atlantic states, Florida, the southern part of the Gulf states, along the immediate Pacific coast of Oregon, over a greater part of California, and in southwestern Arizona. Unusually low temperatures have not been reported, and at a large majority of stations they were considerably above the lowest readings previously noted for November, notably in the central valleys and in the Rocky Mountain regions, where the minimum readings generally ranged from 20° to 30° above the November records of previous years.

Table of comparative maximum and minimum temperatures for November.

State or Territory.	Stations.	For 1888.		Since establishment of station.				Length of record.
		Max.	Min.	Max.	Year.	Min.	Year.	
		°	°	°		°		Yrs.
Alabama	Mobile	82.7	33.5	82.0	1879, 1882	25.2	1887	18
Do	Montgomery	81.5	29.7	83.0	1879, 1882	21.0	1872	17
Arizona	Whipple B'ks	64.5	24.0	75.0	1878, 1885	— 2.0	1886	13
Do	Fort Apache	71.0	19.0	77.0	1882	3.6	1886	10
Arkansas	Fort Smith	79.0	28.0	86.0	1882	17.0	1887	7
Do	Little Rock	81.2	32.0	83.0	1882	10.0	1880	10
California	San Francisco	74.3	47.0	78.0	1871	41.0	1880	18
Do	San Diego	75.2	46.5	85.0	1873	38.0	1881	18
Colorado	Denver	70.2	11.5	76.0	1876, 1879	—18.0	1877	17
Do	Montrose	57.2	16.9	69.0	1885	—18.5	1886	4
Connecticut	New Haven	67.1	10.8	71.5	1882	2.0	1875	16
Do	New London	65.0	13.6	72.0	1882	4.0	1875	17
Dakota	Fort Buford	53.5	1.2	68.5	1887	—29.0	1887	10
Do	Yankton	78.8	9.0	78.2	1887	—18.1	1887	16
Dis. of Columbia	Washington City	75.3	23.9	80.0	1879	12.5	1880	19
Florida	Jacksonville	83.3	38.5	84.0	1875, 1877	26.4	1887	18
Do	Key West	84.0	58.0	91.0	1876	52.0	1873	19
Georgia	Atlanta	77.0	28.4	80.5	1882	16.4	1887	11
Do	Savannah	80.8	36.6	82.0	1875	22.0	1872	18
Idaho	Boisé City	64.8	18.3	71.7	1887	5.6	1887	12
Illinois	Cairo	78.4	28.2	80.5	1882	7.0	1872	17
Do	Chicago	75.2	20.0	72.0	1874, 1882	— 2.0	1872	17
Indiana	Indianapolis	76.0	25.7	75.0	1879	— 5.0	1880	16
Indian Ter	Fort Sill	84.2	22.0	84.0	1885	— 4.0	1880	12
Iowa	Dubuque	72.0	16.5	71.5	1887	—12.0	1887	16
Do	Des Moines	75.0	15.0	73.4	1887	— 9.1	1887	11
Kansas	Dodge City	83.8	18.5	83.0	1875	—12.9	1887	15
Do	Leavenworth	78.8	22.3	80.3	1887	— 4.3	1887	18
Kentucky	Louisville	78.5	25.0	78.0	1879	4.5	1872	17
Louisiana	New Orleans	84.8	41.0	84.7	1885	31.5	1881	18
Do	Shreveport	84.2	33.5	86.0	1882	18.0	1880	16
Maine	Eastport	63.8	5.0	64.0	1882	—13.0	1875	16
Do	Portland	66.6	7.0	66.0	1882	— 6.0	1875	17
Maryland	Baltimore	74.5	25.0	78.0	1879	15.0	1880	17
Massachusetts	Boston	74.0	12.8	75.0	1876	— 2.0	1875	18
Michigan	Marquette	58.6	10.5	69.0	1886	— 9.0	1875	15
Do	Grand Haven	71.6	18.5	69.0	1874, 1886	0.0	1880	16
Minnesota	Saint Vincent	50.0	— 7.0	69.1	1887	—30.2	1887	9
Do	Saint Paul	65.7	6.0	73.6	1886	—24.5	1875	17
Mississippi	Vicksburg	81.3	35.3	84.8	1885	23.0	1877, 1880	17
Missouri	Saint Louis	79.0	28.5	82.0	1879	5.0	1872	18
Montana	Ft. Assinaboine	61.4	— 5.9	70.6	1887	—29.8	1887	9
Do	Helena	57.0	— 4.0	65.5	1887	—17.0	1880, 1881	9
Nebraska	North Platte	74.9	9.0	81.2	1887	—25.2	1887	15
Do	Omaha	77.6	17.2	79.6	1887	—13.6	1887	16
Nevada	Winnemucca	63.7	4.0	71.3	1887	— 9.0	1880	10
New Jersey	Atlantic City	69.0	26.0	72.0	1882	10.0	1875	15
New Mexico	Santa Fé	64.1	12.0	77.0	1878	—11.0	1880	16
New York	Buffalo	67.9	15.0	68.3	1881	2.5	1875	16
Do	New York City	72.3	18.0	74.0	1882	7.0	1875	19
North Carolina	Charlotte	78.0	30.0	80.0	1879	18.0	1880	11
Do	Wilmington	79.3	35.8	83.0	1877, 1879	20.0	1872	18
Ohio	Cincinnati	76.4	26.8	75.0	1879	5.0	1880	19
Do	Sandusky	76.0	24.9	75.0	1879	0.0	1880	12
Oregon	Portland	58.3	31.0	68.0	1873, 1887	22.5	1880	16
Do	Roseburgh	62.0	30.6	69.7	1884	17.5	1880	12
Pennsylvania	Pittsburgh	74.3	24.0	79.0	1876	4.0	1880	16
Do	Philadelphia	75.0	18.0	77.0	1876	8.0	1875	18
Rhode Island	Block Island	64.4	21.0	76.0	1881	19.0	1880	9
South Carolina	Charleston	79.8	36.4	82.0	1879	28.0	1873	16
Tennessee	Knoxville	76.9	26.3	80.5	1881	11.5	1872	18
Do	Memphis	78.2	31.4	82.0	1879	16.0	1877, 1880	16
Texas	Brownsville	87.4	44.0	89.0	1882	30.0	1880	13
Do	Fort Elliott	84.2	22.2	83.4	1885	— 5.4	1887	9
Utah	Salt Lake City	63.1	25.7	70.0	1882	3.0	1880	15
Virginia	Lynchburgh	76.5	25.7	80.2	1882	13.0	1880	16
Do	Norfolk	79.0	33.0	80.0	1879	20.0	1872	18
Washington	Spokane Falls	54.5	15.2	60.0	1885	3.0	1881	8
Do	Olympia	55.0	24.0	63.0	1884	19.8	1887	12
Wisconsin	La Crosse	68.9	8.9	70.0	1874	—21.0	1875	17
Do	Milwaukee	70.5	14.0	70.0	1874, 1882	— 5.0	1880	19
Wyoming	Cheyenne	62.0	7.0	70.1	1887	—20.0	1875	16

RANGES OF TEMPERATURE.

The monthly and the greatest and least daily ranges of temperature at Signal Service stations are given in the table of miscellaneous meteorological data. The greatest monthly ranges occurred in the northern Rocky Mountain slope, middle Missouri valley, and northern Vermont, where at stations they exceeded 70°. Over a greater part of western New England north of Connecticut and Rhode Island, over portions of the upper Mississippi and middle Missouri valleys, and in parts of the northern, middle, eastern, and southeastern Rocky Mountain slopes they exceed 60°. They were least over the southeastern part of Washington Territory, where a range of less than 20° was reported, and over the southern extremity of Florida, where they were less than 30°. Over the east-central portion of the country they averaged about 50°; in the plateau regions of the Rocky Mountain, they varied from 37°.4 at Salt Lake City, Utah, to 59°.7 at Winnemucca, Nev.; along the immediate Pacific coast they fell below 30°, except at Eureka and Los Angeles, Cal., where they amounted to 35°.6 and 43°.8, repectively.

The following are some of the extreme monthly ranges:

Greatest.	°	Least.	°
Fort Custer, Mont	75.2	Fort Canby, Wash	19.3
Fort Laramie, Wyo	75.0	Astoria, Oregon	23.0
Valentine, Nebr	71.0	Key West, Fla	26.0
Northfield, Vt	70.5	San Francisco, Cal	27.3
Yankton, Dak	69.8	Portland, Oregon	27.3
Fort Assinaboine, Mont	67.3	San Diego, Cal	28.7

FROST.

Frost occurred in the south Atlantic and Gulf states as follows: 1st, Ark. 4th and 7th, Ala., Ark. 9th, Ark., La., Tex. 10th, Ala., Ark., Ga., La., Tex. 11th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 12th, Ala., Ark., Ga., La., Miss., N. C., S. C. 13th, Ala., Ark., Ga., N. C., S. C. 14th, N. C. 15th, Tex. 16th, La. 17th, Ark., Ga. 18th, 19th, N. C. 20th, La., S. C., Tex. 21st, N. C., Tex. 22d, Ala., Ark., Ga. 23d, Ala., Ark., Fla., Ga., Miss., N. C., S. C. Tex. 24th, Ala., Ark., Ga., La., Miss., S. C., Tex. 25th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 26th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C. 27th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C. 28th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 29th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex. 30th, Ala., Ark., Fla., Ga., La., Miss., N. C., S. C., Tex.

The following are reports of heavy frost in the Southern states:

Saint Augustine, Fla., 26th: this city was visited by frost last night, a heavy white frost appearing. Thin ice formed throughout the country.—*New York Herald, November* 27, 1888.

Alva, Lee Co., Fla., 26th: the frost which occurred last night was very destructive to tender vegetation.—*Report of voluntary observer.*

Columbia, S. C.: frosts have been reported generally throughout the state. In the early part of the month they were mostly light, but from the 23d to the 30th, inclusive, they were killing. Vegetation was entirely killed.—*South Carolina State Weather Service report.*

University, Miss.: the first frost sufficient to kill tender vegetation occurred on the 11th and 12th, generally throughout the central and northern parts of the state. Hoar frosts were reported on the Gulf coast at Pearlington on the 11th, 28th, and 29th, and at Biloxi on the 28th and 29th.—*Mississippi State Weather Service report.*

Auburn, Ala.: the frosts that occurred toward the close of the month, although heavy, killed only the delicate plants.—*Alabama State Weather Service report.*

New Orleans, La.: the warm spell of the first week of the month was followed by colder, fair weather, with heavy frosts in the northern and light frosts in the southern parishes.—*Louisiana State Weather Service report.*

Galveston, Tex.: the first killing frosts of the season were

generally reported on the 10th in the central, northern, and western counties.—*Texas State Weather Service report.*

As compared with the preceding month the southern limit of frost in the south Atlantic states has extended from middle Georgia to southern Florida in about latitude 26° 30′; in Alabama it has extended from the central portion of the state to the Gulf coast; in Louisiana frost was reported to the extreme southern part of the state and was of frequent occurrence, whereas in October it was not noted south of the thirtieth parallel, and in the state, as a whole, it was reported for but a very limited number of dates; in Texas it was reported as far south as Rio Grande City, while in October the most southerly station reporting frost was San Antonio.

In California frost occurred at Los Angeles on two dates, while at stations to the northward it was reported on from three to four dates.

LIMITS OF FREEZING WEATHER.

On chart vi are shown the southern and western limits of freezing weather during November, 1888. East of the Rocky Mountains the southern limit extends from the Mexican border (about lat. 29°, long. 104°) in a northeasterly direction to central Arkansas, thence southeastward to southern Alabama, and from that locality northeastward to the vicinity of Norfolk, Va., the distance from the coast from southern Alabama to Virginia generally ranging from sixty to one hundred miles. The line indicating the western limit is traced along the immediate coasts of Washington Territory and Oregon to northern California, from which point it extends in an irregular southeasterly direction to southeastern Arizona, there being a gradual increase of distance from the coast line from northern California southward.

TEMPERATURE OF WATER.

The following table shows the maximum, minimum, and mean water temperature as observed at the harbors of the several stations; the monthly range of water temperature; and the mean temperature of the air for November, 1888:

Stations.	Temperature at bottom.				Mean temperature of air at the station.
	Max.	Min.	Range.	Monthly mean.	
	°	°	°	°	°
Canby, Fort, Wash	54.2	45.0	9.2	49.7	47.4
Cedar Keys, Fla	77.0	56.0	21.0	67.3	61.8
Charleston, S. C	71.2	51.9	19.3	63.4	56.3
Eastport, Me	47.8	43.0	4.8	46.1	36.8
Galveston, Tex	75.8	53.9	21.9	64.8	60.6
Key West, Fla	81.7	72.3	9.4	77.6	74.7
New York City	53.0	41.7	11.3	49.1	45.2
Pensacola, Fla	74.5	62.0	12.5	68.7	58.2
Portland, Oregon	53.2	43.0	10.2	47.4	44.0

PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for November, 1888, as determined from the reports of about one thousand stations, is exhibited on chart iv. In the table of miscellaneous meteorological data are given, for each Signal Service station, the total precipitation, with the departure from the normal. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

Over the southwestern portions of the country from the Mississippi River westward to the Rocky Mountains, and in nearly all districts east of the Mississippi, the precipitation for November was above the normal. It was below the normal in the eastern Gulf states and over the northern portions of the country from the upper lake region westward to the Pacific. The excess over the average in Florida and in the districts along the southwestern border was unusually large, the precipitation ranging from two to three times the normal amount. In the west Gulf states about fifty per cent. more than the normal amount of rain fell, and in the south Atlantic states and New England the rainfall exceeded the average by from thirty to forty per cent. In the upper Mississippi and Ohio valleys the excess amounted to about twenty per cent. of the normal, and in the middle Atlantic states to about six per cent.

Less than half of the normal amount of rain fell in the extreme northwest and northern slope. In the middle slope it was about 60 per cent. of the normal; in the east Gulf states, 70 per cent.; upper lake region, 80 per cent.; and northern plateau, 90 per cent. On the north Pacific coast, where the heaviest rainfalls of the month occurred, the normal was not reached, there being a very slight deficiency in that district.

In California, where but little rain fell in October, the November normal has been exceeded by more than 50 per cent.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for a series of years; (2) the length of record during which the observations have been taken, and from which the average has been computed; (3) the total precipitation for November, 1888; (4) the departure of the current month from the average; (5) and the extreme monthly precipitation for November during the period of observation and the years of occurrence:

State and station.	County.	(1) Average for the month of Nov.	(2) Length of record.	(3) Total for Nov., 1888.	(4) Departure from average.	(5) Extreme monthly precipitation for November.			
						Greatest.		Least.	
						Am't.	Year.	Am't.	Year.
Arkansas.		*Inches.*	*Years*	*Inches.*	*Inches.*	*Inches.*		*Inches.*	
Lead Hill	Boone	3.93	7	5.13	+1.20	5.77	1883	2.50	1885
California.									
Sacramento	Sacramento	2.06	22	4.06	+2.00	11.34	1885	0.00	1884
Colorado.									
Fort Lyon	Bent	0.36	12	0.14	−0.22	1.50	1883	0.00	1870
Dakota.									
Fort Randall	Todd	0.59	21	trace.	−0.59	1.50	1866	0.00	1875
Florida.									
Merritt's Island	Brevard	2.43	11	3.15	+0.72	5.67	1884	0.17	1886
Georgia.									
Forsyth	Monroe	3.37	14	5.41	+2.04	5.41	1888	1.01	1887
Illinois.									
Peoria	Peoria	2.32	33	2.67	+0.35	4.93*	1879	0.71*	1875
Riley	McHenry	1.98	28	1.97	−0.01	5.30*	1879	0.72*	1875
Indiana.									
Logansport	Cass	3.03	34	4.37	+1.34	5.76†	1881	1.43†	1880
Vevay	Switzerland	3.16	21	6.34	+3.18	6.34	1888	0.37	1872
Iowa.									
Cresco	Howard	1.56	14	0.23	−1.33	5.20	1879	0.18	1875
Monticello	Jones	2.32	35	2.77	+0.45	5.29	1879	0.12	1865
Logan	Harrison	1.26	13	trace.	−1.26	3.30	1882	trace.	1888
Kansas.									
Lawrence	Douglas	1.92	13	4.54	+2.62	5.15	1879	0.36	1875
Wellington	Sumner	0.97	9	1.28	+0.31	1.98	1881	0.10	1886
Louisiana.									
Baton Rouge	Baton Rouge	5.09	24	1.91	−3.18	9.75	1855	0.45	1864
Grand Coteau	St. Landry	3.67	6	2.36	−1.31	5.71	1883	1.86	1887
Maine.									
Gardiner	Kennebec	4.34	50	5.98	+1.64	10.55	1845	1.14	1882
Maryland.									
Cumberland	Allegany	2.11	17	2.60	+0.49	5.10	1877	0.82	1887
Massachusetts.									
Somerset	Bristol	4.45	18	8.15	+3.70	9.02	1876	1.45	1882
Newburyport	Essex	3.45	9	6.74	+3.29	6.74	1888	0.97	1882
Amherst	Hampshire	3.56	14	4.50	+0.94	5.65	1885	1.33	1882
Michigan.									
Thornville	Lapeer	2.95	12	3.11	+0.16	5.03	1881	1.42	1882
Kalamazoo	Kalamazoo	2.98	13	2.49	−0.49	5.77	1877	1.24	1882
Minnesota.									
Minneapolis	Hennepin	1.25	13	0.45	−0.80	2.48	1886	0.31	1878
Missouri.									
Oregon	Holt	3.07	6	2.75	−0.32	7.81	1879	1.17	1878
Montana.									
Fort Shaw	Lewis-Clarke	c.44	18	0.03	−0.41	0.84	1884	0.01	1877
New Hampshire.									
Hanover	Grafton	2.67	51	5.14	+2.47	5.14	1888	0.59	1882